MONTANA Wildlife

Winter 1964

Montana Fish and Game Department Official Publication

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Cover Picture

(Photo by Eldon Smith)

Wind whips the snow from Sawtooth Mountain as it rears high into Montana's cold winter sky. The rugged mountains form a picturesque backdrop for the Sun River Game range which lies below.

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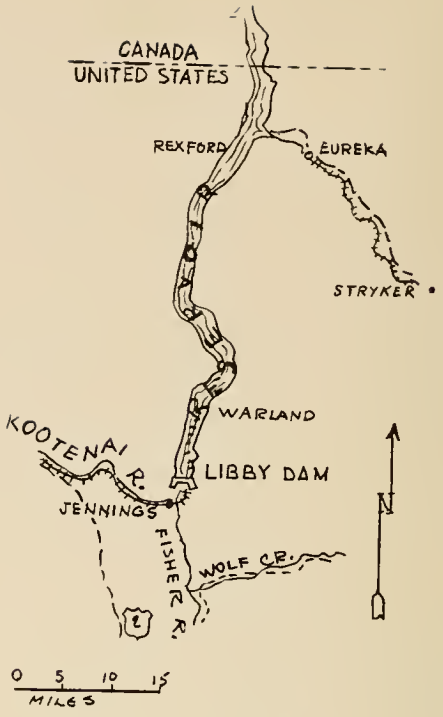
River To Reservoir

by Frank H. Dunkle
Director, Montana Fish & Game Dept.

Now that the United States and Canada have almost completed a Columbia River agreement, the Army Corps of Engineers is expected to start construction on Libby Dam within the next year or so. Libby Dam will be located in northwestern Montana on the Kootenai River and will cost an estimated 332 million hard-earned tax dollars—not counting millions more earmarked for Canadian dams as a condition to our backing water across the border. This mass of concrete and steel, 360 feet high and some 3,000 feet long, will back water up for ninety miles and push the big puddle some forty-two miles into Canada. Agreement calls for water storage seven years after construction begins.

The "multiple purpose", a term which has become cliche with dams, will embrace production of electricity, flood control and recreation. Though it is neither within the scope nor duties of the Montana Fish and Game Department to evaluate power needs, we can ask that all issues get unbiased consideration so that free-flowing streams and wildlife-rich bottom lands are not needlessly sacrificed.

The promoters of Libby Reservoir envision pleasure seekers flocking to the area. Unquestionably, fishing, water skiing, swimming, boating, and other forms of water oriented recreation are gaining in popularity each year. Unquestionably also, an investment in providing more access to the area, improving and adding to camping and picnic areas and other facilities would bring a lot more recreationists to northwest Montana had a dam never even been proposed. Though the project will offer lake recreation, a tremendous stretch of natural river will be lost. It appears that the day is hurriedly coming when wild rivers will be as scarce as Dodo birds.



THE LIBBY DAM SITE

Understandably, reservoirs lack many of the desirable features found in most natural lakes. Libby Reservoir, for example, will have a potential drop in water level of 172 feet during the course of one year. It is, however, expected that this tremendous fluctuation will r a r e l y be reached. The expected fluctuation is sixty feet up and down for the first 15 years, and forty feet for the remaining 85 years the project is expected to last. Ugly mud flats exposed during lower water levels will be, for the most part, off-season so far as recreation is concerned.

Violent ups and downs in water will plague the Kootenai River immediately downstream from the dam. Since the generators can produce more electricity than will be used, they will be operated on what is called a "peaking" system. During the summer and in early daylight hours generators will be closed down and a minimum of water will be spilled from the dam. During dark hours, and particularly in the winter when electricity demands are

greatest, more water will be released to power the generators, result — water levels of the river will vary as much as eight feet and the best that can be hoped is that it will not rise more than one foot per hour. Fishermen below the dam had best be alert and nimble, or they could find themselves in serious trouble.

Right now the Kootenai River offers good fishing, particularly for cutthroat trout, but also for rainbow and Dolly Varden. Float trips on the river are popular and during the winter whitefishermen come in from as far as Kalispell. Ling fishing is seasonal and of short duration, but it is still popular. Fishing potential of the river is practically untouched.

Libby Dam will substitute reservoir fishing for river fishing. The change in environment will be more suitable for scrap fish such as chubs, suckers, and squawfish than it will for trout. Trout require tributaries for spawning, but there will only be about five trbiutaries with spawning potential once the reservoir is filled; consequently, fish stocking will be required. Experience elsewhere has shown that even an expenditure as high as one dollar each year per surface acre for planted fish will not guarantee good fishing. Libby Reservoir will spread over nearly 50,000 surface acres during normal operation.

Construction of Libby Dam will be felt on other rivers additional to the Kootenai. A stretch of the Great Northern Railroad within the impoundment site will have to be relocated. The Fisher River and Wolf Creek will be sacrificed for a railroad grade. There will be sixteen stream channel changes in the lower twelve and one quarter miles of the Fisher River, five and one-half miles of the river will be altered, and it will be shortened by a mile.

Such projects have an effect on game animals as well as fish. The Libby project will be felt by whitetailed and mule deer, mountain sheep, moose, elk, black bears, Franklin's grouse, ruffed grouse, sharptailed grouse, several kinds of furbearing animals, and many species of waterfowl. Fourteen thousand acres of deer winter range will be flooded, thirty-five hundred acres of mountain sheep winter range will be flooded, and there will be a great loss of waterfowl habitat to flood control in the down-stream Kootenai Flats.

The Montana Fish and Game Commission is working to see that everything possible be done to minimize the damage to fish and wildlife resources that will be effected by the project. This includes measures to protect trout spawning facilities in the five main tributaries to the reservoir. The Commission has requested that the project provide a state fish hatchery and operating funds to stock the reservoir. They have also asked that an amount of water necessary for trout survival be maintained at all times below the dam and that the water be within temperatures suitable for trout. Stream channel changes should be kept at absolute minimum, and measures should be taken to control sediment going into the river during construction. Erodable areas which result from the project should be protected by rip-rap or vegetation.

Since each reservoir has a personality of its own, the commission is asking the project to provide funds for fish management investigations. Such investigations will include efforts to reestablish trout runs in tributaries to the reservoir and will determine the best sizes, numbers, and timing methods for fish planting.

In order to compensate for losses to wildlife the Fish and Game Commission is asking that suitable lands be acquired to replace lost game habitat. The commission is also requesting that adequate public recreation and access areas be provided on the reservoir and though they feel that these should be managed by a state agency, the U. S. Army Corp of Engineers is evidently in the recreation business as well as dam building and intend to manage these facilities (except those on U. S. Forest Service land) the state's wishes not withstanding.

New Hunting - Fishing Licenses

There's something new in Montana's hunting and fishing licenses—particularly those issued to residents. The licenses you get for 1964 will look and cost differently than those of past years. You might pay more or less than you did last year, depending on how many kinds of animals you intend to hunt, the number of deer you want to take, and whether or not you fish.

There are advantages to the new system, and probably more fairness than previously. Sportsmen will pay for the licenses they use. For example, a fisherman will not pay as much as the man who fishes and hunts too; hunters who wish to hunt birds only will not pay as much as deer hunters; the man who wishes only to take a single deer will not pay as much as those who wish to take two, etc.

A higher premium will be placed on hunter safety as a direct result of the revised licensing setup. Any Montanan eighteen years old must have had training in safe handling of firearms before he gets any hunting licenses. Children under 12 will not be able to take part in game hunting. This does not, however, prevent them from hunting rabbits, ground squirrels, and other non-game or non-furbearing animals.

There are advantages to the department too in economy, in ease of accounting, and in having a more ready source of statistical and law enforcement information. There are advantages to license agents in that they will only have a few kinds of license books to keep on hand.

Licenses that you may pick up at any license agents will be broken into four main categories, or forms.

FORM 1—Form 1 can be used for the resident fishing license, resident bird and bear license, non-resident season fishing, non-resident limited fishing, or non-resident game bird.

FORM 2—Available on Form two will be resident elk and one or two deer.

FORM 3—Form three will be used for mountain goats and sheep in limited areas, wild turkeys, and non-resident twenty dollar deer licenses.

FORM 4—The fourth form will be used as the non-resident $100.00 big game, bird, and fishing license.

Licenses for antelope, moose, and sheep and goats in limited areas will remain the same as they were in 1963.

For most of us, the 1964 fishing license will be our first acquaintance with the new forms and costs. In past years the resident fishing license was, in addition to fishing, a license to hunt game birds. Before a Montanan could buy a big game license, he had to own a bird and fishing license.

The cost of a 1964 resident fishing license is $3.00. It does not authorize the holder to hunt game birds, but persons no longer need to have a fishing license before they can buy a big game license.

The resident fishing license form also includes the resident bird and bear license. The bird and bear license ($2.00) is required before the hunter can purchase any big game license other than bear.

On this one form then a resident may be licensed to fish only ($3.00), or only to hunt bears and game birds ($2.00), or to fish and hunt game birds and bears ($5.00). Non-residents are licensed on this form too for season fishing ($10.00), limited fishing ($3.00) or game bird hunting ($25.00).

Resident licenses for deer and elk are printed on a second form. The cost of an elk tag, an "A" deer tag, or a "B" deer tag is $1.00 each. These tags may be purchased in any combination on the same license form.

As in the past years, the elk and "A" deer tag may be used in any legally open hunting area. The "B" tag can be used to take a second deer, but only in two deer districts as specified by current big game regulations.

AUTHORIZED BY THE FISH AND GAME COMMISSION

STATE OF MONTANA – FISHING AND BIRD-BEAR LICENSE 1964

NAME _____

ADDRESS _____

CITY _____ STATE _____

AGE _____ HEIGHT _____ WEIGHT _____ SEX _____

EYES _____ HAIR _____

DATE ISSUED

IF UNDER 18, CERTIFICATE OF COMPETENCY NUMBER:

MONTANA FISH AND GAME COMMISSION

Frank V. Dunkle

SECRETARY

HUNTERS SIGN AND PASTE MIGRATORY BIRD HUNTING AND ARCHERY STAMP ON REVERSE SIDE OF THIS LICENSE.

NO.

RESIDENT ☐ I HEREBY DECLARE THAT I AM A CITIZEN OF THE UNITED STATES OF AMERICA WHO HAS CONTINUOUSLY RESIDED WITHIN THE STATE OF MONTANA FOR A PERIOD OF SIX (6) MONTHS IMMEDIATELY PRIOR TO MAKING APPLICATION FOR SAID LICENSE, OR WHO IS A LEGAL RESIDENT OF THE STATE.

NONRESIDENT ☐

ARMED FORCES ☐ I HEREBY DECLARE THAT I, OR A MEMBER OF MY IMMEDIATE FAMILY, IS IN THE ARMED FORCES AND HAVE BEEN ON ACTIVE DUTY IN MONTANA FOR THE PAST THIRTY (30) DAYS. ASSIGNMENT ORDERS WILL VERIFY.

AMOUNT PAID: $ _____ FOR TYPE OF LICENSE PUNCHED BELOW

SIGNATURE OF LICENSEE: X _____

SIGNATURE OF LICENSE AGENT: _____

WHEN ISSUED AS A 6-DAY FISHING LICENSE, THIS LICENSE IS VALID THE DAY ISSUED AND SIX (6) DAYS THEREAFTER.

THIS LICENSE EXPIRES APRIL 30, 1965

RESIDENT GAME			NONRESIDENT		
BIRD AND BEAR $2.00	FISH-BIRD AND BEAR $5.00	FISHING $3.00	FISHING-SEASON $10.00	FISHING – 6 DAY $3.00	BIRD $25.00
A-1 *	A A-1 *	A *	B *	B-3 *	B-1 *

TWO PUNCHES VOIDS LICENSE PUNCH ONLY ONE

AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR.

DAY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

PUNCH OUT MONTH AND DAY OF KILL ABOVE

The fish bird and bear license is shown actual size here. A punch mark will indicate what licenses have been purchased on this form. The bird and bear is prerequisite to any other hunting licenses.

VOID BOTH DEER TAGS	VOID ELK & DEER B TAG	VOID ELK & DEER A TAG	LICENSE VOID IF MORE THAN ONE NUMBERED BLOCK IS PUNCHED
5 * A-5 ELK $1.00	6 * A-3 DEER A $1.00	7 * A-4 DEER B $1.00	

AUTHORIZED BY THE FISH AND GAME COMMISSION

STATE OF MONTANA – RESIDENT BIG GAME LICENSE 1964

NAME _____

ADDRESS _____

CITY _____ STATE _____

AGE _____ HEIGHT _____ WEIGHT _____ SEX _____

EYES _____ HAIR _____

MONTANA FISH AND GAME COMMISSION

Frank V. Dunkle

SECRETARY

DATE ISSUED _____

I HEREBY AFFIRM THAT THE ABOVE STATEMENTS ARE TRUE AND CORRECT

SIGNATURE OF LICENSE AGENT X _____

LICENSE ISSUED BY _____ AMOUNT PAID: $

LICENSEE'S FISHING AND BIRD – BEAR LICENSE NO.: NO.

THIS LICENSE EXPIRES APRIL 30, 1965

DEER A ELK $3.00	DEER B $3.00	DEER A $2.00	DEER B $2.00	ELK $2.00	DEER B $2.00
1 *	A-3 A-4 A-5	2 *	A-3 A-5	3 *	A-3 A-4	4 *	A-4 A-5
VOID NO TAGS		VOID DEER B TAG		VOID ELK TAG		VOID DEER A TAG	

CUT OUT DATE AND MONTH AT TIME OF KILL DO NOT DETACH BEFORE

SEPT. OCT. NOV. DEC. JAN. FEB. 31 30 29 28 27 26

A-5 ELK

NAME

ADDRESS

COUNTY OF KILL

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

PUNCH IN THIS BLOCK * VOIDS TAG

SEPT. OCT. NOV. DEC. JAN. FEB. 31 30 29 28 27 26

A-4 B TAG

NAME

ADDRESS

COUNTY OF KILL

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

PUNCH IN THIS BLOCK * VOIDS TAG

SEPT. OCT. NOV. DEC. JAN. FEB. 31 30 29 28 27 26

A-3 A TAG

NAME

ADDRESS

COUNTY OF KILL

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

PUNCH IN THIS BLOCK * VOIDS TAG

This license is shown actual size also. A punch mark will void tags not to be used. Licenses checked in the field will be cross-checked with original forms in order to discourage illegal use of licenses.

A third license form will be used for mountain goats ($5.00), bighorn sheep ($15.00), wild turkeys ($2.00), and non-resident deer ($20.00). A special tag is attached to each of these licenses. THIS SPECIAL TAG MUST NOT BE TORN

FROM THE LICENSE until it is to be used; otherwise, the license will be void.

Goat and sheep licenses on this form will be issued only for areas where there is no limit on numbers of licenses to be issued. A resident bird and bear license or a non-resident $100.00 license must be in the hunter's possession before he can buy the goat, sheep, or turkey license. Non-residents who hold a $25.00 bird license are also eligible to buy the $2.00 turkey tag.

Licenses to hunt goats and sheep in areas where a limit has been set on numbers of licenses to be issued will be issued from Helena as will moose and antelope. Hopeful hunters must enter a drawing to determine who will get licenses.

When applying for any of these licenses, the fees must be included with application forms. Fees will remain the same for

CARCASS TAG ATTACHED—DETACH AT TIME OF KILL AND ATTACH CARCASS TAG TO ANIMAL

AUTHORIZED BY THE FISH AND GAME COMMISSION

STATE OF MONTANA — SPECIAL BIG GAME HUNTING LICENSE 1964

NAME _____

ADDRESS _____

CITY _____ STATE _____

THIS LICENSE VALID FOR HUNTING ONLY ONE ANIMAL AS INDICATED BY PUNCH AT BOTTOM OF LICENSE.

MONTANA FISH AND GAME COMMISSION

Frank H. Dunkle

SECRETARY

AGE	HEIGHT	WEIGHT
SEX	EYES	HAIR

RESIDENT BIRD – BEAR LICENSE NO.. _____

NON RESIDENT $100.00 BIG GAME LICENSE NUMBER: _____

I HEREBY AFFIRM THAT THE STATEMENTS ON THIS LICENSE ARE TRUE AND CORRECT.

SIGNATURE OF LICENSEE: X _____

SIGNATURE OF LICENSE AGENT _____

DATE ISSUED: _____

FOR TYPE OF LICENSE PUNCHED BELOW

AMOUNT PAID: $ _____

THIS LICENSE EXPIRES APRIL 30, 1965

ISSUED FOR UNLIMITED AREAS ONLY

MOUNTAIN GOAT $5.00	BIGHORN SHEEP $15.00	NONRESIDENT DEER $20.00	TURKEY $2.00
*	*	*	*
		NO PREREQUISITE	

TWO PUNCHES VOIDS LICENSE PUNCH ONLY ONE

NO.

The carcass tag below must remain attached to the above license until it is to be actually placed on a downed animal. When the carcass tag is detached, the license becomes void. (actual sizes)

1964

CARCASS TAG

FOR USE ON ANIMAL PUNCHED BELOW

WARNING

THIS TAG MUST BE DETACHED, SIGNED, DATED AND AFFIXED TO THE CARCASS IMMEDIATELY FOLLOWING KILL. (PLASTIC ENVELOPE MAY BE USED.)

LICENSEE SIGNATURE _____

ADDRESS _____

PLACE OF KILL (COUNTY) _____

MAP AREA NO. _____

THIS LICENSE EXPIRES APRIL 30, 1965

ISSUED FOR UNLIMITED AREAS ONLY

MOUNTAIN GOAT $5.00	BIGHORN SHEEP $15.00	NONRESIDENT DEER $20.00	TURKEY $2.00
*	*	*	*

TWO PUNCHES VOIDS LICENSE PUNCH ONLY ONE

moose ($25.00), sheep ($15.00), and goats ($5.00). A NOTABLE DIFFERENCE WILL BE A $1.00 FEE FOR ANTELOPE. Applicants who are not lucky in the drawings will get their special license money back.

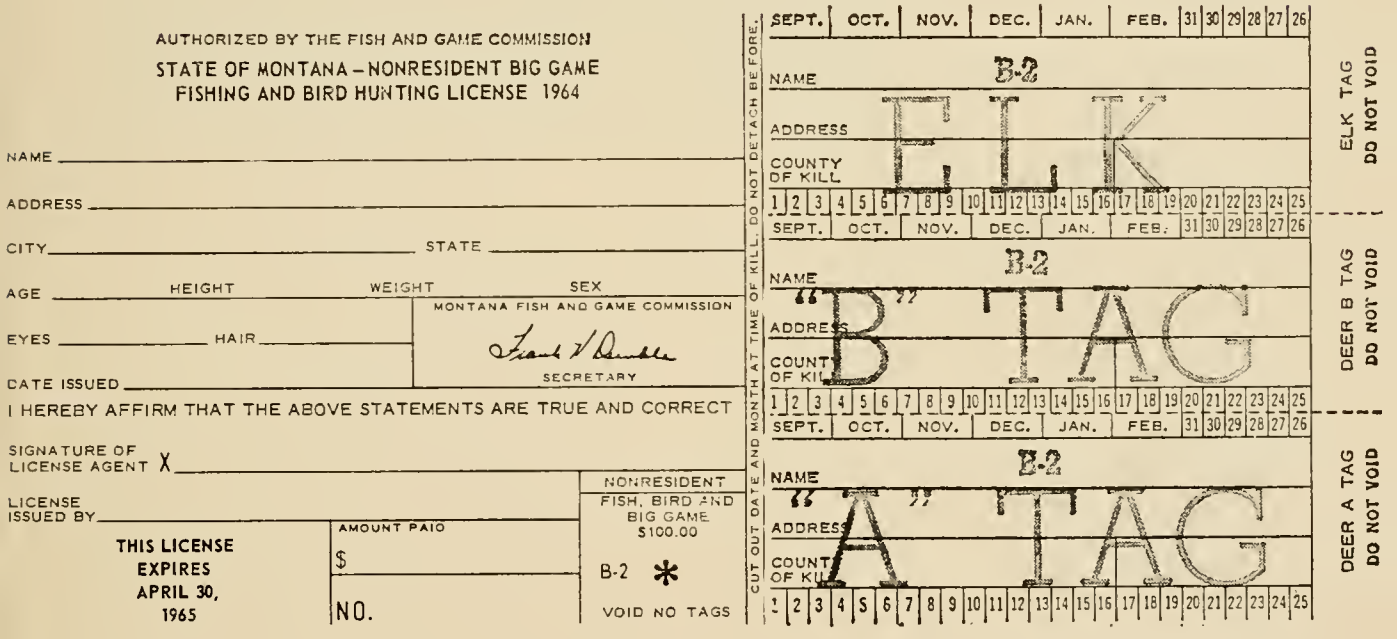
In the event that applications for antelope are fewer than the number of licenses available in certain areas, then the surplus may be issued at $1.00 each to residents who hold a bird and bear license, to non-residents who hold a $100.00 big game license, or at $20.00 to non-residents who do not hold a $100.00 license.

The fourth form will be a non-resident $100.00 license. This authorizes the holder to hunt elk, deer, bear and game birds, and to fish. It also allows him upon payment of additional fee to enter drawing for special licenses, though Montana law limits non-residents to no more than 10% of moose and sheep licenses issued through drawings.

SOME POINTS TO REMEMBER:

Youngsters and senior sportsmen have some extra things to keep in mind. Youths twelve to eighteen years old must have a certificate of competency before they can get a bird and bear license. A hunting license from past years is no longer an acceptable prerequisite for purchase of a hunting license. CHILDREN UNDER TWELVE WILL NOT BE ISSUED HUNTING LICENSES OF ANY KIND. In

The cost of this non-resident license is $100.00. (actual size)



other words, children under 12 cannot legally hunt game birds or game animals. They can still hunt rabbits and other non-game animals.

Senior sportsmen seventy years old or older who are residents of Montana need not buy a Montana fishing license in order to fish. They must have with them proof of their age and residency, however. Senior sportsmen are not, however, exempt from having hunting licenses to hunt all game birds and game animals.

All Persons who wish to hunt big game animals or birds must possess the proper licenses.

BE SURE TO PICK UP PLASTIC ENVELOPE FOR EACH TAG.

New game tags will not take rough wear, so they'll need some extra protection when

attached to carcasses. License agents will give out plastic envelopes with each tag they issue. Place the proper game tag in the envelope when you tag a carcass.

LOOK AHEAD WHEN YOU BUY

There won't be any basement bargains or clearance sales on hunting and fishing licenses, but a hint or two on how to buy may save you inconvenience. The careless buyer could conceivably make a half dozen trips to the license agent over the course of a season, and wind up with as many licenses to keep track of.

When you pick up a fishing license, also pick up the bird and bear license at the same time if you intend to hunt any birds or animals this year. This will save you an extra trip and extra license. As explained, the three licenses are available on one form, and the bird and bear must be in your possession before you can pick up any other hunting license.

Try also to decide on elk and deer hunting before picking up this particular license. You can pick up two deer and one elk tag on the same license, or you can go to the license agent three times and pick up three licenses individually.

IF YOU LOSE A LICENSE

In the event you lost a license which cost you more than one dollar, then you may get a duplicate license for one dollar at any license agent. If a one dollar license is lost, then a license of the same type may be purchased from a license agent. If a special license (antelope, moose, sheep, goats, etc.) or a non-resident license is lost, an application must be filed with the Fish and Game Department and the Department will issue a duplicate license from Helena for $1.00. —Seems complicated? It really isn't. The main thing to remember is try to determine which licenses you're going to want over the year. Your license agent will worry about the details.

This mule deer weighed out 300 pounds hog-dressed. It was taken near Sidney by C. W. Dotson (kneeling with rifle). The big buck had an antler spread of 41 inches and weighed approximately 400 pounds alive.

Montana Deer Weights

by Richard J. Mackie, Research Biologist

How big was the deer you shot last fall —100 pounds, 150 pounds, 200 pounds? If it wasn't weighed, then chances are it was smaller than you estimate, for deer, like most game animals, are generally smaller than they look to the average hunter. Even when no guesstimates or exaggerations are involved, discussions of deer weights can lead to arguments. Weights, like other physical characteristics, vary considerably by sex, age, time, and forage supplies. Thus, there are normally considerable differences between individuals.

Since 1948, over 2,500 mule deer and more than 1,500 white-tailed deer have been weighed during the deer seasons at checking stations throughout Montana. This information shows what Montana deer weigh, how deer weights vary, and some of the things that influence weights of deer.

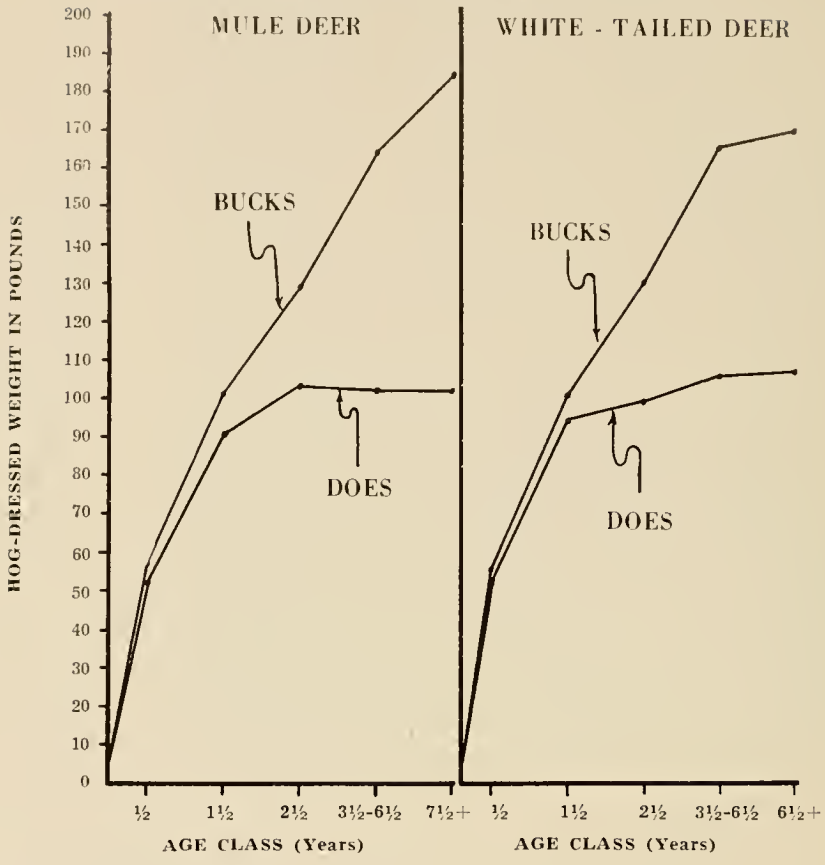
Mule Deer Weights

Average hog-dressed weights (only entrails removed) based on all **mule deer** weighed at checking stations, are shown in Figure I on page 10. Individual weights will vary around those shown. The extremes in weight variation and range within which most mule deer fall are shown in Table 1 on page 11.

The average weight of mule deer fawns at birth in June is just under eight pounds. Male fawns average slightly heavier than female fawns. The difference in weight between bucks and does increases with age, becoming especially noticeable at 2½ years. Bucks continue to increase in weight at least to the age of 7½ years. Does grow rapidly to the age of 1½ years and only very little change in weight occurs after they are 2½ years old. At least part of the difference between the size of

Figure 1

Average hog-dressed weights of mule and white-tailed deer from Montana ranges—1948 and 1963.



bucks and does may lie with the fact that the skeletons of does stop growing about two years before those of bucks do.

For practical purposes, where actual weights cannot be taken, the hunter can consider most fawns as weighing 50 to 55 pounds, most yearling bucks (spike, 2, or 3 point antlers) and adult does at about 100 pounds. Two and one-half year old bucks (3 to smaller 4 or 5 point antlers) weigh about 125 pounds, prime bucks (larger 4 to 6 point antlers) about 160 pounds, and old bucks (cheek teeth worn smooth) between 180 and 200 pounds.

Records of extremely large deer killed in Montana are few since only a small proportion of the deer killed each fall are weighed and recorded. The heaviest Montana mule deer for which we have records, was a buck weighing 340 pounds hog-dressed (only entrails removed) taken from the Sweetgrass Hills region and another from Vipond Point near Melrose. Another mule deer buck weighing 305 pounds hog-dressed was recorded at a checking station in the Fisher River area during the 1949 season; still another (see accompanying photograph) weighing 300 pounds hog-dressed was taken near Sidney in 1953. There are authentic records of mule deer bucks weighing 380 pounds hog-dressed from California.

White-Tailed Deer Weights

Average hog-dressed weights of all white-tailed deer weighed at checking stations are also shown by sex and age class in Figure 1. The same qualifications as given for individual mule deer weights apply here. The extremes in weight variation and the weight ranges within which most white-tails fall are given in Table 2.

At birth in June, white-tail male fawns average about 7½ pounds and female fawns weigh about 6 pounds. Growth of white-tails is essentially the same as described for mule deer. For practical esti-

Table 1. Extreme weights and weight ranges of most Montana mule deer by sex and age class.

	Fawns		1½ Years		2½ Years		3½-6½ Years		7½ Years +	
	Extreme	Most	Extreme	Most	Extreme	Most	Extreme	Most	Extreme	Most
Bucks	37- 95'	50- 60	67-140	90-110	89-180	115-145	80-219	140-180	130-305	160-210
Does	27- 75	45- 55	65-120	85- 95	75-130	90-110	73-125	90-110	74-122	90-110

' Hog-dressed weight in pounds.

Table 2. Extreme weights and weight ranges of most Montana white-tailed deer by sex and age class.

	Fawns		1½ Years		2½ Years		3½-6½ Years		7½ Years +	
	Extreme	Most	Extreme	Most	Extreme	Most	Extreme	Most	Extreme	Most
Bucks	39- 71'	50- 60	70-150	90-110	90-190	115-145	75-180	140-180	140-200	150-200
Does	40- 71	45- 55	60-125	85- 95	95-165	95-110	65-130	95-115	65-130	95-115

' Hog-dressed weight in pounds.

mates of weights, the general estimates given on page 10 for mule deer would also be applicable to white-tails.

Since white-tailed deer account for less than one-third of the annual deer harvest in Montana, even fewer records of large animals are available. The heaviest Montana white-tail on record is a buck which weighed 275 pounds hog--dressed. He was taken along the Mizpah River in Custer county during the 1960 season. Across the northern range of the white-tail some extremely large bucks have been taken. Wisconsin records show two bucks weighing 386 and 378 pounds hog-dressed, and the dressed weight of a Michigan white-tail buck was 354 pounds.

Mule Deer vs. White-tailed Deer

A common misconception is that mule deer are much larger than white-tails. This belief may have arisen because in areas such as Montana where both species are common larger mule deer are indeed shot by hunters. However, on the basis of average weights shown in Figure 1 and weight ranges given in Tables 1 and 2, it would have to be agreed that the two species are almost identical in weight. Only among bucks 7 years and older are mule deer weights distinctly greater. This may be due to the fact that under typical light or moderate hunting pressures, more "old" bucks occur among the somewhat less productive, and perhaps longer-lived mule deer. Too, when considering weights from across the range of the white-tail, they compare favorably with our largest recorded mule deer weights.

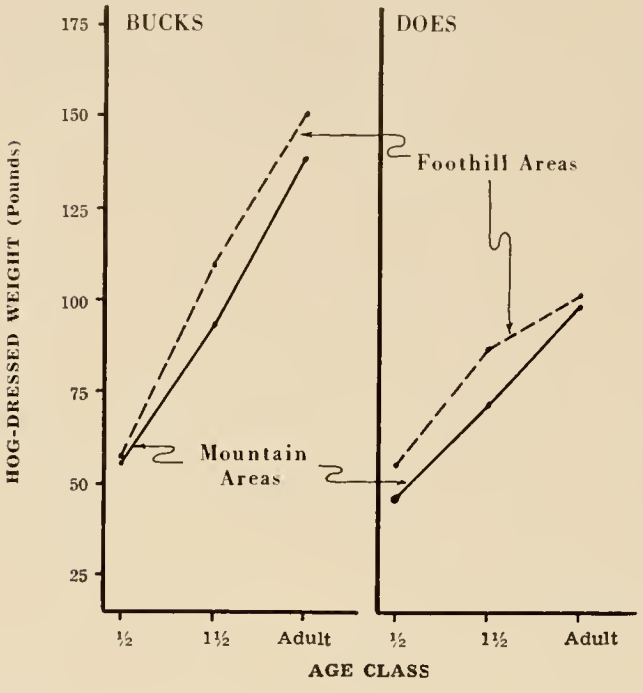
Big Deer vs. Little Deer

Most hunters are aware that deer run larger in some areas than others; many also note that "deer are not as big as they used to be" in certain places. Why? The most important factor is the food supply. Look at Figure 2, on Page 12, which shows average dressed weights of mule deer bucks and does from foothill and adjacent high mountain ranges in the Stillwater area. Bucks from the foothill area average 17 pounds heavier than bucks of the same age groups from the mountain area. A significant difference in doe weights also is evident. This is typical wherever deer weights from high mountain and foothill or prairie border habitat are compared.

Deer in all regions have about the same average weight at birth. Therefore, deer from all areas and range types potentially could attain about the same average adult weight. The difference must lie with the

Figure 2

Comparison of average hog-dressed weights of mule deer from high mountain and foothill ranges — Stillwater area, 1957.

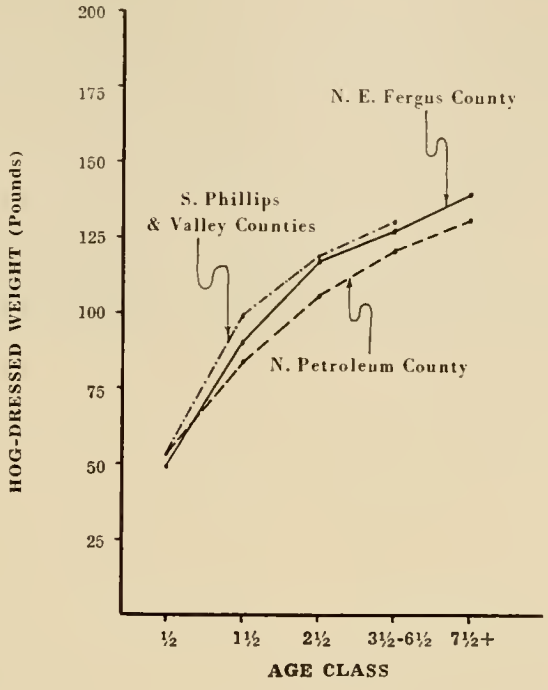


nourishment received. Mountain deer as a rule, occupy a more severe, uniform and less productive habitat, and move down onto very restricted winter range areas. Heavy use of the forage on these wintering areas year after year by excessive numbers of deer has gradually reduced the supply of nutritious browse to a point where, in most winters, there no longer is enough to go around. Many deer starve. The remainder must recover from severe winter weight losses before any new growth can occur, and remain underweight the rest of their lives. Also, and perhaps more importantly, deer on the more accessible foot-hill ranges are subjected to heavier hunting pressures and harvests. Thus the supply of browse available to deer on these ranges is greater, winter weight losses are less extreme, and heavier weights can be attained during the fall and throughout life. Evidence that hunting has this effect is shown by Figure 3 where deer weights from three adjacent, similar areas of the Missouri River breaks are compared. The three areas have good deer numbers, but important browse plants are in poor condition as a result of excessive use during past years. The South Phillips-South Valley county is the principal deer hunting country for residents of the Malta-Glasgow vicinity and personnel from the Glasgow Air Force base. It has received the greatest hunting pressure and overall deer harvest in recent years. The Northeast Fergus county area lies along and is readily accessible from U. S. Highway 191. Resident hunters, supplemented by nonresidents, have taken only moderately heavy deer harvest during the past several years. The North Petroleum County area is accessible only by 35 to 50 miles of travel over dirt or gumbo roads and trails. Hunting pressures and deer harvests historically have been very light. Average deer weights correspond directly to hunting pressures and deer harvest of the three areas. Deer from the two heavier hunted areas average 7 to 20 pounds heavier than deer of the same age from the lightly hunted area where proportionately more deer remain to share less food after the hunting season.

Similar comparisons could be made for other areas in Montana and other states. In all, the healthiest, heaviest, and the

Figure 3

Comparison of average hog-dressed weights of mule deer from three areas of different hunting pressure and deer harvest in the Missouri River breaks.—Combined weights of bucks and does, 1960-.63.



most productive deer are found where food supplies are adequate and hunter harvests keep deer numbers in balance with available forage.

One case, seemingly paradoxical to all of this, needs explanation. Why then, some hunters may ask, are more big bucks taken from high-mountain back-country or lightly hunted areas? The answer is that big bucks are older deer. In these back-country or other lightly hunted areas, there simply are more older animals among the deer. On accessible, heavily hunted ranges, few deer get a chance to grow old. If these same big old bucks from the back-country had been taken on a foothill or other heavily hunted range, they probably would have been 20 pounds or more heavier.

Live Weight vs. Dressed Weight

Hunters frequently ask how much their hog-dressed deer would have weighed alive. Our studies show that between 25 and 30 per cent of the live weight is lost in field dressing. The exact percentage will vary somewhat with the sex and age of the deer and the time of day it was shot. For practical purposes, a close approximation of the live weight will be obtained if one-third of the hog-dressed is added. Thus, the live weight of a hog-dressed prime buck weighing 150 pounds would be computed as 200 pounds. The largest mule deer buck killed in Montana would have weighed 340 + 113 or 453 pounds alive.

Hog-dressed Weight vs. Meat

Another point of interest to many hunters is the amount of meat available from a deer. This varies considerably depending on the age, size, and condition of the deer as well as the amount of meat spoiled in killing the animal or thrown away in skinning and butchering.

Information from studies in New York, related in the book "The Deer of North America," indicate that the following conversions can be made for deer handled reasonably well: a 200 pound hog-dressed deer yields about 175 pounds of edible meat; a 150 pounder, 120 pounds; a 125 pounder, 95 pounds; a 100 pounder, 75 pounds; and a 50 pound fawn, about 30 pounds. Practical estimates of the amount

ANTLERS TOO! Food supplies affect antler growth as well as body weight. The photograph on the left shows antlers from yearling bucks. The spike antlers are typical of antler growth under very poor food conditions; the three-point antlers developed with good conditions. On the right are antlers from 2½-year old bucks—the two point antlers were grown under poor conditions, the five-point rack under good conditions.

of meat available from most medium sized deer could be made by subtracting one-fourth of the hog-dressed weight. Somewhat less would have to be subtracted for bigger deer; somewhat more for smaller deer.

Weights Mean More than Pounds of Meat

A knowledge of the factors that determine deer weights, and the relationships between average deer weights, deer food supplies and deer harvest is important to game managers. Game managers compare average weights for large numbers of known sex and age deer with deer weights from other years. This information is correlated with fawn production and survival, the amount, use and condition of important food plants and deer harvest data. By putting all these things together they get a pretty good picture of how deer are doing in particular areas and what changes, if any, are needed in their management.

Thus, a knowledge of deer weights becomes a very useful tool in good deer management. The final goal of management is to provide hunters with as many deer as practicable over years to come.

Fish and Game Realignment

The axiom that nothing is static—that everything changes is true in the field of administration. A business or agency that intends to operate at peak efficiency must recognize changing needs and take advantage of new principles. Administrative stagnation also means change, but generally for the worse.

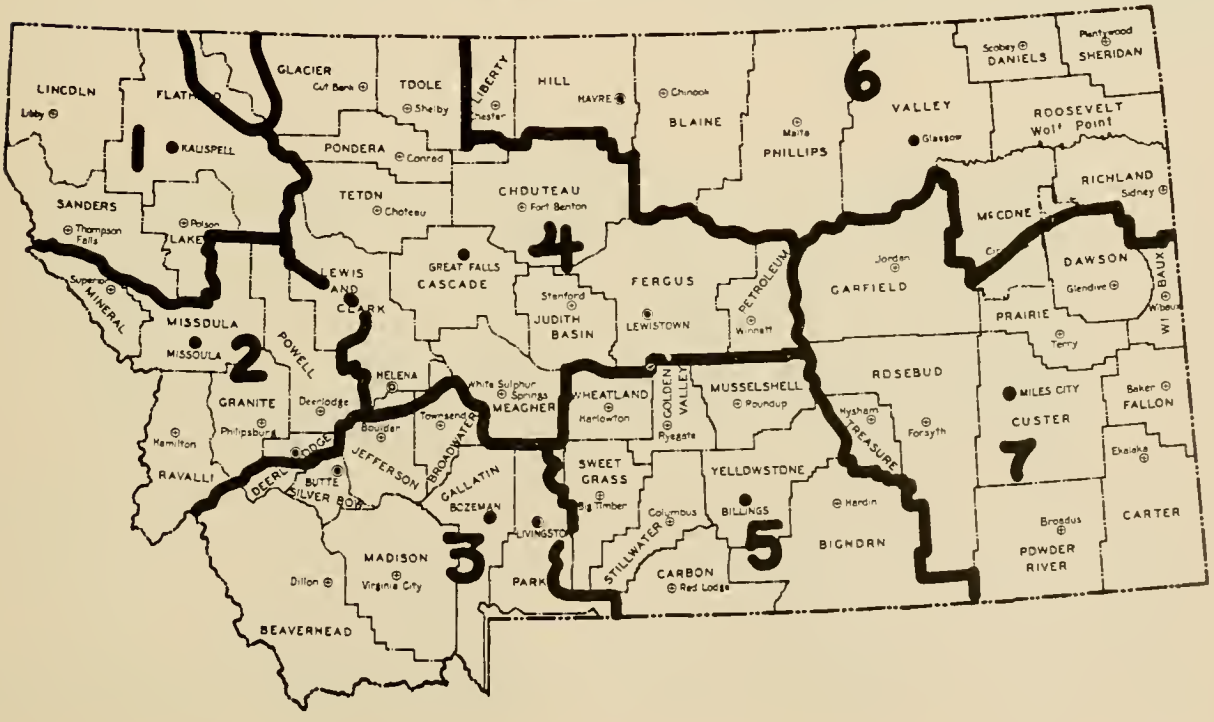
The Montana Fish and Game Department has recently realigned its administrative structure for more efficiency. A district supervisory system is now in effect. For convenience, the state has been sub-divided into seven districts with headquarters in Kalispell (District 1); Missoula (District 2); Bozeman (District 3); Great Falls (District 4); Billings (District 5); Glasgow (District 6), and Miles City (District 7).

Each supervisor has complete supervision of all persons assigned to his district and is responsible solely to the Department Director or, in his absence, the Deputy Director. Previously, there was no single authority in a district. A staff made joint decisions on the district level as well as joint recommendations to the director.

Division chiefs compose the Director's staff. With realignment, there has also been a change in the function of this staff. It will coordinate and plan various activities of the department under direct supervision of the director. Whereas the Helena staff previously had supervision over district personnel, they do not now have such authority except as representatives of the director.

A new position, Recreation and Lands Development, was necessitated by growing need for planned access to hunting, fishing and other recreation areas.

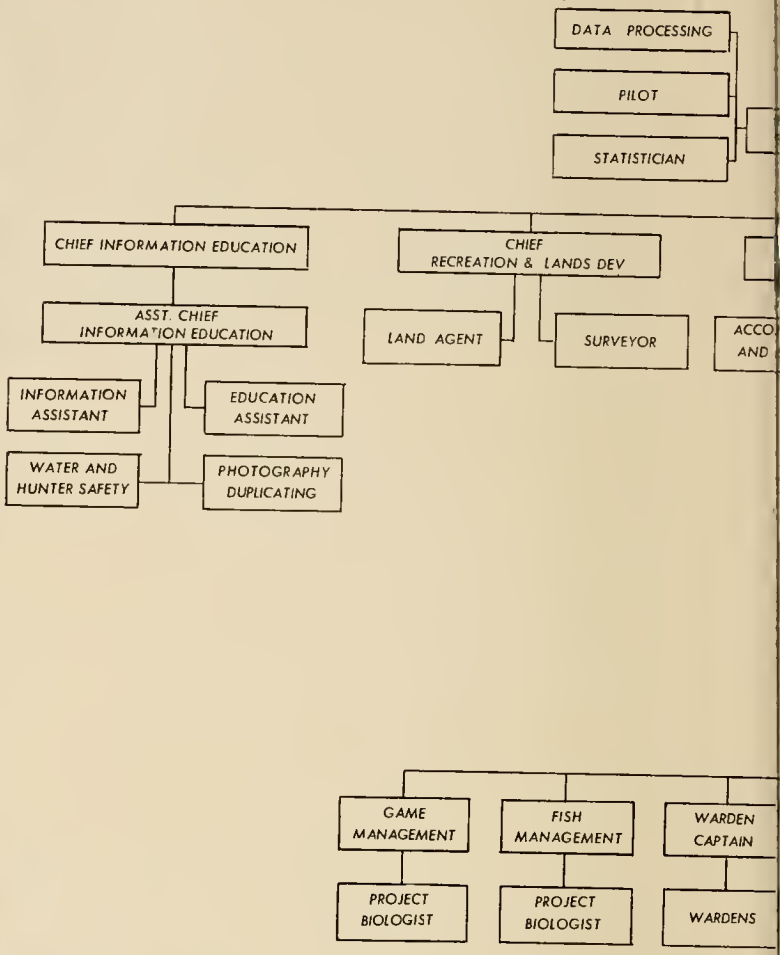
FISH AND GAME ADMINISTRATIVE DISTRICTS



FISH AND GAME ORGANIZATION CHART

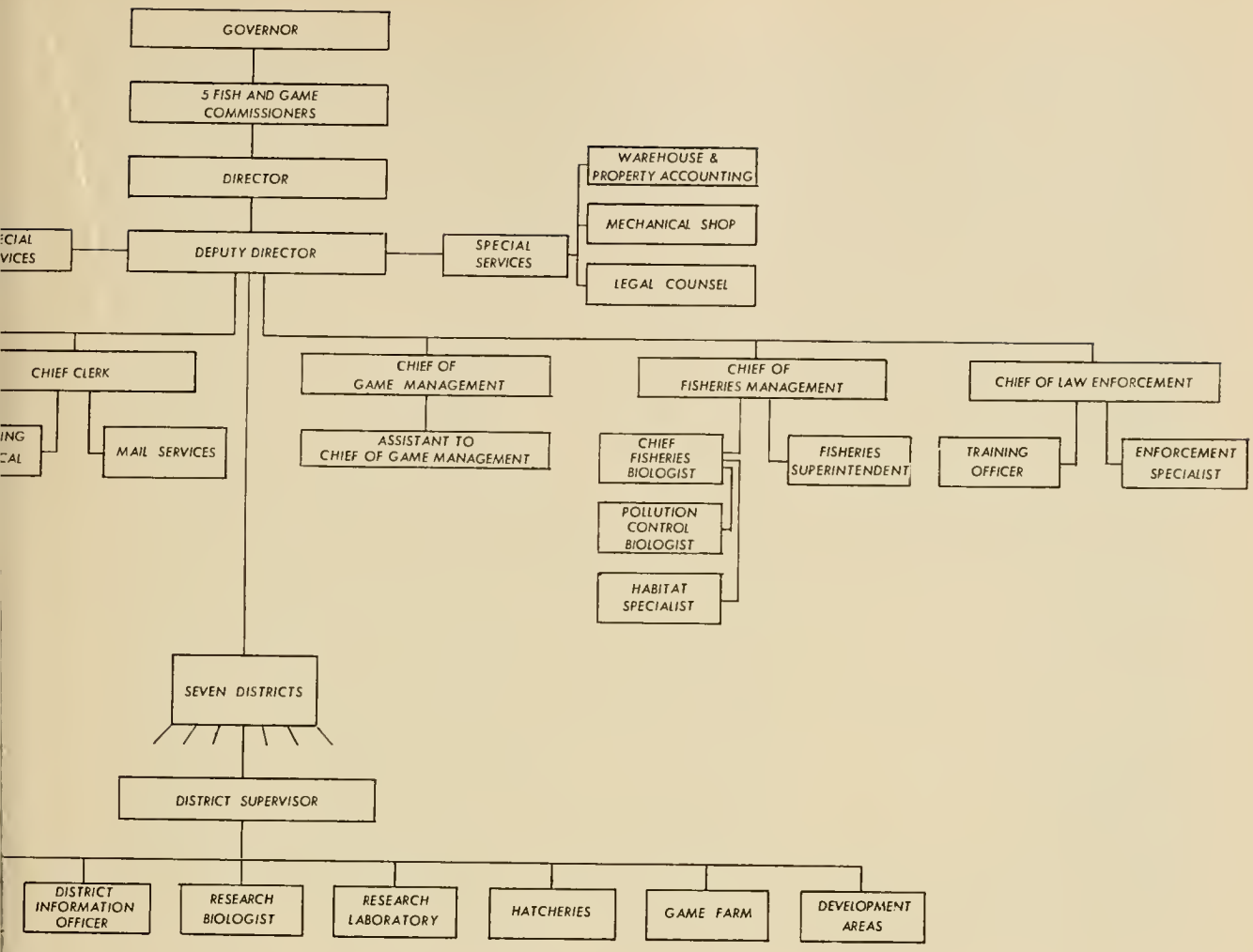
FRANK H. DUNKLE DEPT. DIRECTOR

KEITH A. FRESEMAN, DEPUTY DIRECTOR



THE DIRECT
Left to right: L
Chief of Inform
tion; Robert C
Recreation and
Bob Turnbull,
Wynn Freeman
Management; An
of Fisheries M
ville Lewis, Ch
force

DISTRICT SUPERVISORS
Left to right: Don L. Brown, District 1; W. J. Everin, District 2; LeRoy Ellig, District 3; Dr. Robert Eng, District 4; Fletcher Newby, District 5; Wesley Woodgerd, District 6; William Maloit, District 7.



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Doctor Dee Laine, Past Association President, proudly displays an award for "THE OUTSTANDING LOCAL CLUB OF 1962" presented to the Western Montana Fish and Game Association by the National Wildlife Federation.

A Top-Notch Club

Sportsmen's clubs date way back—probably to the time when hunting and fishing became a form of relaxation rather than a necessity. Like all clubs, they have run the gamut of effectiveness from those categorized as "bite and grin" to ones that have made significant contributions to conservation of natural resources.

The Western Montana Fish and Game Association of Missoula, Montana is a sportsmen's group that has really accomplished some outstanding projects. Their aggressiveness and sincerity is so impressive that they were chosen from the National Wildlife Federation members to receive the "President's Award" as the outstanding local conservation club of 1962.

The Western Association has taken on many projects. They were instrumental in affecting a division of migratory waterfowl flyways in Montana, having worked for over ten years to accomplish the unprecedented action.

Another notable project was begun in 1961 when the Association started a statewide pollution abatement program. The support of numerous other sportsmen's clubs was enlisted, and some very positive and beneficial progress in pollution control and abatement was made.

In 1963, the Association tackled the problem of fish habitat loss through stream alteration. Though legislation which they sponsored was not adopted, the wholehearted support that they gave to a similar bill sponsored by the Montana Jaycees was of great benefit in passing the law to help preserve trout streams.

This group of sportsmen certainly cannot be accused of lacking backbone. In the face of much adverse criticism, the executive committee chose to publicly defend the Yellowstone Park elk reduction program as the only effective conservation measure available at the time this program was receiving national publicity. They stated that "We believe trapping and transplanting are desirable where range studies reveal adequate carrying capacity. We do not feel that a satisfactory system of controlled hunting in the Park has been devised."

Other segments of the Western Association program include: pheasant restoration in the Flathead Valley, and an evaluation of the program; action for and support of hunter safety education, a fence stile program to improve hunter-landowner relationships; a children's fish pond and recreation area. The Association sponsors and supports many other programs of education, publicity, and landowner-sportsmen relations.

The secret of the Association's success and energetic perpetuation lies, in part at least, in their willingness to take on big jobs, such as the support or opposition to legislation which has a real and long lasting effect on conservation. They have also had the vision to work closely with clubs in other areas of the state.

Sportsmen, conservationists, and persons who just plain enjoy the outdoors can be justly proud that there are such groups as the Western Montana Fish and Game Association.

Don Aldrich past president of the Association and Stanley Stipe set up a stile on the Stipe Ranch near Charlo.

Adult Dragonfly—Enlarged

Insects of The Water

by BOB AVERETT

Beneath the shimmering riffles of clear streams and in the scummy plant-choked ponds there is a strange world. So great in numbers and so diverse are the residents of this water empire that the complexity of their lives and their communities is nothing less than fabulous. Nearly every body of water, from the steaming pools of Yellowstone Park to glacier-fed lakes of the far north, hold some form of life. There are tiny forms, so small that individuals can be seen only with a microscope. There are the larger ones which include fish and are of more immediate interest to sportsmen. The smaller plants and animals are of great importance too for they are the ultimate food source for the fish and other larger animals.

One important group of animals that live in the water at least a part of their lives are the insects, and though they are not nearly so numerous as their landlubber relatives, they make up a large part of the food eaten by trout. To many persons insects are "bugs" and aquatic insects are bugs that live in the water. This is partially true for one order of insects are among the true bugs, and some of them are water-dwellers. More will be said about this later.

Insects all have six legs, three on either side of the chest region. They usually have feelers (antennae) on the head and commonly have several tail filaments. Although there are great numbers of insects in the world, relatively few live in the

water during any portion of their lives. The ones that are dependent upon water (usually during earlier stages of growth) are called aquatic insects.

The kinds and habits of aquatic insects vary greatly. Immature insects living in the water are called **nymphs** or **larva** depending upon the changes they go through from immaturity to adulthood. The bodily changes that nymphs and larvae go through is called metamorphosis. If an insect in his infancy looks entirely different than his parents, metamorphosis is called complete. An example of complete metamorphosis is the change that a worm-like caterpillar goes through to become a butterfly. An insect that goes through incomplete metamorphosis looks much like his parents even during early stages of growth, excepting he doesn't have wings. The immature forms of these insects are called nymphs. An example of this kind of an insect is the stonefly. The adult, often called a salmon fly, lives on land and breathes the air while the nymph, often called a hellgrammite or scratcher, lives submerged in the water.

Emergence is the act of insects leaving their water homes and occurs when the immature insects develop into adults. Some actually emerge during the winter and skip about on the snow, but most emerge during the spring or late summer when the streams are warmer. While many emerge most actively during darkness some emerge only during hours of sunlight.

Egg laying varies with the species and the season. In most cases eggs are laid on the water, but some kinds actually go beneath the water surface to deposit their eggs.

Some aquatic insects prefer the quiet water of ponds, lakes or stream pools while others are almost entirely restricted to the swift riffles of streams. Still others are found in both places.

The following discussion covers only a few of the more common insects found in Montana. They will be divided into groups, and a general account will be given of each.

STONEFLIES (Salmon Flies)

Order—Plecoptera

After a lengthy period of immaturity stonefly nymphs stir from the safety of covering stream rocks and creep from the water. They climb awkwardly upon a piece of vegetation or other object and prepare for terrestrial life. In a short time the outer skin of the emerging insect splits down the back and the insect pulls itself from the skin to adulthood. Wings that had been folded in pads are spread to dry and stiffen in the air. Before long, the adults fly heavily away to mate and deposit their eggs, thus completing their life's cycles.

Adult stonefly recently emerged. Over twice actual size.

Identification:

Adults: Adult stoneflies have four, large-veined wings. They have two short tail filaments and usually long feelers (antennae) on the head region. Two claw-like appendages on each foot also helps identify the stonefly.

Nymphs: The nymphs are characteristically stout-bodied insects with fluffy gills, often on the underside of the body. They, like the adults, have two tail filaments and two claws on each foot.

Size: These are rather large insects. The big salmon fly sometimes is over two inches long.

Metamorphosis: Metamorphosis is incomplete and immature forms are called nymphs.

Food: Although usually vegetarians, some stoneflies feed upon other insects.

Habitat: Adults are usually seen flying about streams or resting on nearby objects.
Nymphs are usually in swift water of streams or on the wind-swept shores of lakes. Almost without exception they are found under the larger stones in stream riffles of unpolluted water.

Eggs: The adult drops her eggs on the water surface.

Emergence: Emergence varies with the species. Some even emerge during mid-winter, however emergence is usually during spring.

Distribution: Stoneflies are found state-wide in fast-flowing streams. Some 90 species are known to be in Montana.

Stonefly nymph near four times actual size. Hair-like fluffs next to body are gills.

Stoneflies, as a group, are among the most important aquatic insects in Montana streams. Large, prolific, and widely distributed they constitute an important trout food. Limited studies on Rock Creek, east of Missoula, show that stoneflies made up over 60 per cent of the food eaten by rainbow trout during the study period. Studies in other parts of the nation show the stonefly to be an important fish-food.

Anglers fishing the larger streams such as Rock Creek, Big Blackfoot, Big Hole, Madison and Jefferson rivers are familiar with the large stonefly, commonly known as the salmon fly. The nymph or immature stage, locally called a hellgrammite or scratcher, spends from one to three years in a stream before emerging as an adult. This well-known stonefly emerges mid to late spring and great swarms of them often gather over the streams or on the nearby shores. This is the season when trout fishermen really hits pay dirt.

Although Montana's streams host a variety of aquatic insects, none seem to raise the furor of a trout more than a stonefly hatch. As trout bait any time of year the stonefly rates high. The adults can easily be picked off the trees or rocks surrounding the stream shore and the nymphs can be captured by holding a window screen in a riffle area and kicking up the stream botton above the screen.

After several weeks the emergence tapers off and the streams settle down to normal. Emergence varies with the season and weather. As a result, the first to show are usually at the lower reaches of streams. The emergence moves upstream as the season progresses.

In order to grow, any form of life must have food, and insects are especially important as trout foods. In turn, the insects are ultimately dependent upon plant life in the water. The green scum on ponds or rocks of stream beds, and the long green, hair-like filaments trailing in the riffles are the basic foods for animal life in the water. The plants are called producers, for they develop raw materials into plant tissues. The next link in a food chain are the animals that feed directly upon plants. These are called converters because they convert plant tissue to animal tissue. Next in line are the consumers—predatory animals that eat other animals. Among the consumers are damsel and dragonfly nymphs, some stonefly nymphs, aquatic beetles and, of course, the fish.

CADDISFLIES Order—**Trichoptera**

Identification:

Adults: The adult caddisfly is a delicate-bodied insect and looks almost moth-like. When at rest their wings form a roof shape as they are held over the body. The wings are covered by fine, silken hair. Their legs are long and two feelers (antennae) curve from the head.

Larvae: The larvae of many caddis species are accomplished builders and often construct about themselves a covering of small pebbles, sticks, and and other materials found in streams. The young are characterized by two hooks on the last body segments.

Size: They are quite small insects, rarely over an inch long.

Metamorphosis: Metamorphosis is complete. The immature form is first known as a larva. The larva transforms into a pupa which eventually becomes a winged adult.

Food: Immature caddis eat both animal and vegetable material.

Habitat: The adults, usually found near water, are very secretive and move about mostly at night. During daylight they skulk in cool, dark, quiet places.

The larvae are found in almost every type of water from swift mountain streams to lowland swamps.

Eggs: Eggs are often laid in masses on stream bottom rocks. Like some mayflies, the adult females of some caddisflies go beneath the water surface to deposit eggs. Some caddisflies lay their eggs on vegetation overhanging a stream or pond. When the eggs hatch, the larvae drop into the water.

Emergence: Emergence begins during early spring and extends through late summer.

Distribution: Many forms are represented throughout Montana. As a group they are probably distributed world wide. Everyone who has turned over stones in a stream has seen caddisfly larvae. These insects are found, almost without exception, in all non-polluted Montana streams and lakes. The adult forms, because of their secretive habits, are not too commonly known, consequently many persons don't associate the free flying adults with the larvae or pupal stages of development.

Top—Two kinds of adult caddis flies (about 2½ times actual size).
Lower—Hydropsyche (about 2½ times actual size) and various cases enlarged almost twice.

The larvae forms vary greatly in their habits and kind of water they inhabit. Generally speaking, there are three types likely to be found. They are: free-living forms that do not build cases or spin nets; the net-spinning forms that build silken nets, and the case-making forms that build portable cases of various materials.

The free-living forms live upon stream or lake bottoms and move about like stonefly and mayfly nymphs.

The net-spinning forms secrete silken strands and form a net somewhat like a spider's web. Nets are made in various shapes, depending upon the species. Often the net is funnel-shaped with the wide end of the funnel facing upstream and the larva living in the stem portion. The stream current brings food into the funnel to nourish the larva. When it comes time for the larva to pupate it merely closes off the front end of the funnel and begins its quiescent pupal stage. The common rock worm **(Hydropsyche)** is an example of a net-spinning caddis fly larva.

Case making forms are probably the most familiar. These forms build cases of almost any type of material available, such as sand grains, small pebbles, leaves, sticks, etc. One such case builder **(Brachycentrus)** builds a square, somewhat tapered case almost perfect in form. The case-making forms can often be found with their legs and head sticking out of the case. When alarmed they pull themselves into the case much like a turtle withdraws into his shell.

When a case-making larva gets ready to pupate it closes part of the case opening with a grain of sand or some other object leaving a small opening so water may circulate within the case and thus bring in oxygen.

The larva forms usually spend one year or so in the water. After pupation, they emerge as adult insects, mate and lay their eggs. Little is known of how long the adults may live.

Caddisflies are an important source of food for trout. Next time you catch a trout, examine its stomach contents. Chances are it will contain several types of caddisfly larvae and perhaps an adult or two. Because of their small mouths and feeding habits, whitefish seems to be particularlarly fond of caddisfly larvae.

MAYFLIES Order—**Ephemeroptera**

Identification:

Adults: Adult mayflies have one claw on each foot, often have three tail filaments and hold their wings upright while at rest.

Nymphs: Nymphs also have one claw on each foot, often have three tail filaments and usually have seven pairs of fluffy gills, located on various parts of the body.

Size: The mayflies are usually slender delicate insects, but a few have rather stout bodies. Larger ones grow to 1½ inches long.

Metamorphosis: Metamorphosis is incomplete so immature forms are known as nymphs.

Food: Mayflies are strictly vegetarians, feeding upon the tiny water plants.

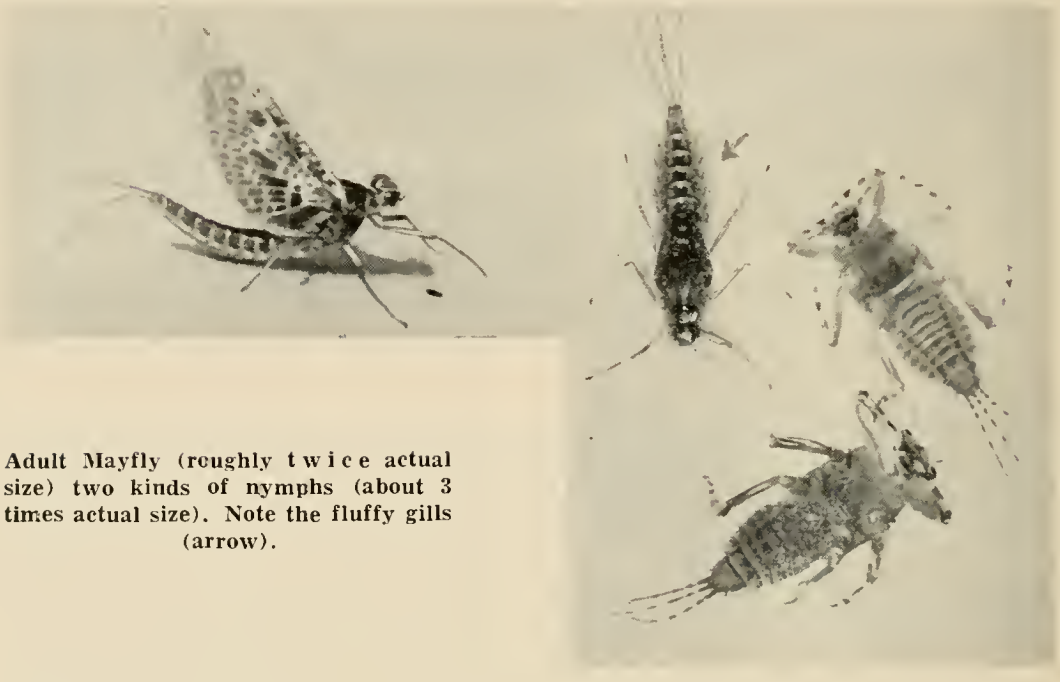
Habitat: The adults can be seen flying low over streams and ponds during the summer. They are attracted to light and often gather around city street lights or on windows.

The nymphs are found in almost every type of unpolluted water from lowland lakes to high fast-flowing streams.

Eggs: Some species go beneath the water's surface and lay their eggs on rocks and vegetation, while others merely deposit their eggs on the water's surface.

Emergence: Mayflies habitually emerge during the spring and summer months, often at night.

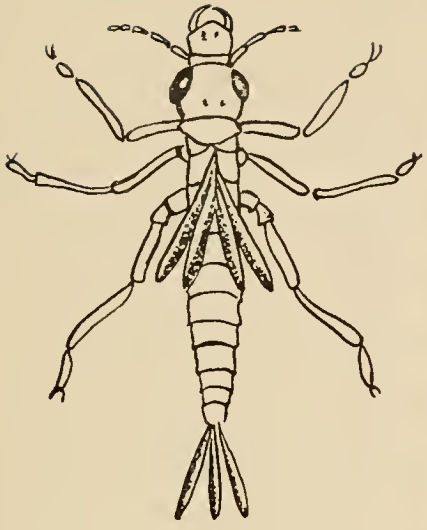
Distribution: They are found statewide in Montana and every fly fisherman knows the mayfly. This widely distributed insect is imitated by dry fly patterns more than any other type. As a group they are one of the most important fish foods in the nation.



Adult Mayfly (roughly twice actual size) two kinds of nymphs (about 3 times actual size). Note the fluffy gills (arrow).

The adult mayflies are interesting creatures. They often go through an additional molt after leaving the water and gaining wings. The first winged form looks like an adult and is capable of flight, but is not sexually mature. During this stage it is known as a subimago, meaning sub-adult. This sub-adult form sheds its skin—even a fine layer over the delicate wings—and becomes a sexually mature adult. The sub-adult molt often takes place several hours after the nymphal form leaves the water. The adults often live only a few hours, hardly ever longer than several days. Nature allows them time only to molt, mate and lay eggs.

The order name for the mayflies is **Ephemoptera** of Greek origin and means lasting but a day. Mayfly nymphs spend from one to three years in the water. Some species even spend less than one year in their water world.



Damselfly, actual size, adult and nymph about three times actual size.
The dragonfly is illustrated on Page 20.

DRAGON AND DAMSELFLIES Order—**Odonata**

Identification:

Adults:

Dragonflies: The swift flying dragonfly is a large insect with a long slender body, large rounded head and large round eyes. While resting, they hold their wings horizontally away from each other.

Damselflies: The damselflies are rather large insects too with slender bodies and large rounded heads. Unlike dragonflies, damselflies hold their wings upright or vertical when at rest.

Nymphs:

Dragonflies: They are stout bodied insects with several short projections on the last abdominal segment. Dragonfly nymphs are aptly named for they are large, ferocious members of the insect world. The dragonfly nymphs have no outside gills. Their lower lip is strong and ideally suited for reaching out and grasping prey. It is folded under the head when not in use.

Damselflies: Damselflies are much slimmer than dragonflies. They have three feather-like gills on the last segment of their abdomens. The lower lip is strong and adapted for reaching out and grasping prey. This large lip is folded under the head when not in use.

Size: Prehistoric dragonflies had a wingspan over two feet. Today's specimens are much smaller but still large for insects and sometimes grow to three or four inches long. Damselflies are usually smaller ranging from one to two inches.

Metamorphosis: Metamorphosis is incomplete and immature forms are called nymphs.

Food: Both dragonflies and damselflies feed upon other animal life, mostly insects.

Habitat: Swiftly and erratically, adults fly over ponds and streams during bright sunny days. Dragonflies are strong fliers and often wander long ways from water. Damselflies are not the strong fliers that dragonflies are and thus are usually found close to water.

The nymphs are most commonly found in ponds and lakes, particularly the warmer ponds. They are sometimes found in streams, even fast flowing streams.

Eggs: Egg laying varies with the species and perhaps the individual. Some lay eggs on the water surface, while others deposit them in stems of water plants.

Emergence: Nymphs emerge from early spring through late summer.

Distribution: Both dragonflies and damselflies are found throughout Montana. They are distributed over the nation, also parts of the Orient and the Pacific Islands.

Because of their large size and beautiful colors dragon and damselflies attract the attention of all stream and pondside wanderers. They often perch on top of cattails and other marsh vegetation awaiting their prey. When another insect to their liking comes by, they sweep upon it much like a hawk swoops upon a bird. Both adult and nymphal forms feed upon other insects.

The nymphs of dragonflies and damselflies are often mistaken for the nymphs of stoneflies. They can, however, be easily distinguished since the dragonfly lacks tail filaments while damselflies have three tail filaments. In contrast, stoneflies have only two tail filaments.

The nymphs live from one to four years in the water, depending upon the species. During the winter months when the water becomes colder, they often burrow into the mud and go through a period of torpor. Some

Dragonfly nymph enlarged slightly. The spoon-shaped lower jaw is extended.

dragonfly nymphs actually camouflage themselves with bits of green algae.

The damsel and dragonflies prowl the water world looking for food. The nymph either stalks or waits for its prey to come within range, then in a flash extends its lower lip, grasps its prey and pulls the victim towards it. When not extended the lower lip is folded beneath the head.

Dragon and damselflies emerge similarly to the pattern followed by stone flies. That is, the mature nymph crawls from the water onto some shoreside structure, slits the back region of the nymphal skin and emerges as an adult.

Both nymphs and adults are fed upon by a variety of fishes. Particularly pond fishes such as the bass.

BEETLES Order—**Coleoptera**

Identification:

Adults: An adult beetle is characterized by thick, leathery forewings and thin hind wings. The forewings meet to form a straight line down the back.

Larvae: The larvae differ greatly from the adults and differ among species, thus they are difficult to identify. Many larvae have strong pincer-like jaws.

Size: Beetles range from extremely small insects to large ones, one and a half inches long.

Metamorphosis: Metamorphosis is complete and immature forms are called larvae.

Habitat: Aquatic beetles usually prefer shallow quiet pools or ponds. however some live in swift streams.

Eggs: Eggs are often laid on water plants.

Distribution: Beetles range state-wide and are distributed world wide. They represent one of the largest insect groups but only a few types are aquatic.

The larvae of aquatic beetles differ from the adults, and from one species to the next they are difficult to describe. As a group they are of some importance as fish food. The small riffle beetle seems to be a favorite of whitefish.

Aquatic beetles winter in the adult stage and often burrow into the mud during cold weather. The eggs are laid during the spring on water plants. When the larvae are ready to pupate, they crawl out of the water and make an earthern shell where they live during pupation.

Adult aquatic beetles like the true bugs require free oxygen to breathe.

Three kinds of water beetles enlarged slightly.

TRUE BUGS Order—**Hemiptera**

Identification

Adults: The true bugs come in a variety of shapes and sizes. All have four wings or no wings at all. The front part of the forewing is thick and hard while the hind part is thin and almost transparent. When the wings are folded they form a definite X. This is perhaps the easiest way to identify this group of insects. The mouth parts of a water bug consist of a beak.

Nymphs: Nymphs are similar in appearance to the adults except their wings are shorter.

Size: The bugs range in size from extremely small to about two inches long. Most common ones are about one-half inch long.

Metamorphosis: Metamorphosis is incomplete so immature forms are called nymphs.

Food: Bugs eat both vegetation and other insects.

Habitat: Both adults and nymphs of the aquatic bugs live in water. Most common habitat is ponds but some live in streams. Some adults move from one pond to another.

Eggs: Eggs are usually laid during early spring upon floating or submerged objects, depending upon the species. Some even lay eggs on backs of crayfish or on the shells of snails.

Emergence: Since both adults and nymphs live in water there is apparently no true emergence. Often adults will leave ponds during the nighttime.

Distribution: Water bugs are found state-wide in Montana and are common in warm water ponds. The true bugs or half-wings **(Hemiptera)** are a diversified group but only a few species are aquatic. We said earlier that there was only one group of insects that were called bugs by scientists—this is the group.

One of the interesting characteristics of true bugs is that they must have free oxygen to breathe. They cannot remove oxygen from the water but must periodically come to the surface for a new supply of oxygen. Because of this feature they are able to live in stagnant water that has a low supply of dissolved oxygen. The most common true bugs found in Montana are the water boatman, backswimmer and the water strider.

The water boatman is a medium sized insect measuring about one-half inch long when fully grown. The hind

The familiar "water strider" or "water skimmer" is a true bug.

pair of legs on this insect are flattened for swimming and may look like a pair of ears. They are probably the most abundant of the aquatic Hemiptera. When a water boatman uses up his supply of air he goes to the surface and gets a fresh supply of air that forms a glistening sheet around the insect. This trapped air makes the boatman lighter than water so he grasps something on the bottom of the pond in order to remain submerged.

Water boatmen are active all winter in the adult stage. Eggs are laid in the spring on submerged objects. The eggs and adults are eaten by humans in Mexico and Egypt but here they are important mainly as links in the food chain of the water world.

The water striders are well known to almost everyone who spends time on Montana's streams and lakes. This thin - bodied, long - legged insect is found on the surface of almost every body of water. Water striders are extremely predacious, feeding upon every type of insect they can catch. Like most members of the true bug group they have a scent gland. This may account for the fact that fish don't eat them. Water striders are able to stand upon the surface film of water because their long legs are covered by small hairs. They are all surface insects even the larvae.

Mention has been made of insects breathing dissolved oxygen while others require free air. Free air is the air as we breathe it. Dissolved oxygen on the other hand, is oxygen that has been dissolved in the water either from the atmosphere or from oxygen produced by water plants. Often, pollution removes so much dissolved oxygen from the water that desirable insects and fish actually suffocate.

TRUE FLIES Order—**Diptera**

Identification:

Adults: The true flies have only two wings, as such, for the hind wings are reduced to two rounded knobs called halters. They are characterized also by very slender necks.

Larvae: Larvae (often called maggots) are worm-like and though they often have fleshy appendages (pro-legs) on their bodies they do not have true legs.

Sizes: Flies range from extremely small individuals to species slightly over two inches in length.

Metamorphosis: Metamorphosis is complete and the immature are known as larvae.

Food: Some species eat plant material while others eat animal material. Adults are primarily sucking type insects. The mosquito is an example. Larvae feed upon decaying matter.

Habitat: Adult flies are found in almost every situation. Aquatic forms, of course, are most often found near water.
The larvae are found in almost every type of water.

Eggs: Some kinds of aquatic flies lay their eggs in water. Females fly over water and drop their abdomens through the surface in order to deposit eggs. Females of other species lay eggs on stream banks.

Emergence: Time of emergence varies greatly but it usually takes place from early spring to late summer.

Distribution: The true flies are found throughout the world and statewide in Montana. The true flies or **Diptera** (meaning two-wing) constitute one of the largest orders of insects in the world. About one-half of the known species are aquatic or semi-aquatic. It is impossible in this brief article to give a detailed account of their types and habits.

The most common, perhaps, is the house fly; however, this species is not aquatic. The cranefly, mosquito and another very large group known as the midges will be used as examples of aquatic types.

The cranefly adult is a rather large fly with a long slender body and equally long slender legs. In fact, it is the daddy-long-legs of the fly world. Some craneflies lay their eggs in the water, while others lay them on the stream bank. Big Springs Creek near Lewistown, Montana, is an example of a place where the cranefly female lays her eggs on the stream bank. Fishermen at Lewistown call the larvae "grubs". The larvae of craneflies are unusually large for such a slender, frail insect that they develop into. Cranefly larvae can be found in almost any type of water situation and larvae can be collected throughout the year.

Long-legged cranefly (enlarged) and larva, bottom. Arrows point out halteres on adult.

Mosquitoes are well known to all Montana fishermen. Every farm boy is familiar with the larvae and pupal stages of the mosquito that so often develop in the rain barrel on horse-trough. Mosquito larvae are well adapted to almost any environment. They can withstand periods of severe drought, prolonged wet periods and sub-zero temperatures. Unlike most aquatic insects the pupae of mosquitoes are active.

Midge flies are the "no-see-ums" of the insect world but despite their sizes are a very important fish food. These small flies, found almost everywhere in the world, are the insects so often seen flying over streams and lakes during mid-summer. Many trout fishermen carry some black hackles tied on a size 18 hook to imitate the midge fly. The larvae of midge flies are worm-like creatures with fleshy appendages at each end of their bodies. Many cover themselves with soft dirt tubes. They feed upon algae and decayed vegetation.

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